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# *Growing Barley*



FOR MALT AND FEED



**FARMERS' BULLETIN NO. 1732  
U.S. DEPARTMENT OF AGRICULTURE**

**B**ARLEY IS GROWN for both malt and feed. The information presented in this bulletin should enable the farmer to decide what variety to grow and whether to exercise the care necessary to obtain grain that meets the maltster's requirements. Most of the barley produced is certain to be fed. It is a very useful grain feed, and the yield per acre is high in the Northern and Western States. Many farmers should grow barley for consumption on the farm.

Barley intended for malting should be well grown, it should be plump and mellow and carefully threshed, and it should be free from damage by disease and weather. Certain regions are particularly adapted to the growing of malting varieties and to the production of barley of the quality desired. Only rarely is grain of good malting quality produced elsewhere.

There is need for barley both for feed and for industrial alcohol. One way to get increased production is to grow the proper variety and to seed it at the right time, with the right quantity of seed per acre. The latest recommendations on these matters are given in the last section of this bulletin, separately for each State in which barley is an important crop.

# GROWING BARLEY FOR MALT AND FEED

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## RECENT TRENDS AND PRESENT PROBLEMS IN BARLEY GROWING

**B**ARLEY grows well in a cool, humid climate. It will stand more heat under semiarid conditions than under humid conditions. When grown in warmer climates, it is often winter-sown. The most favorable growing conditions are found in the Northern and Western States, where it produces a high yield per acre. Gradually farmers in these States have come to realize the value of the barley crop, and there has been a slow expansion of the acreage. In recent years the increase in winter barley acreage in the Southeastern States has been marked. All this grain is used for feed.

About 20 to 25 percent of the national crop is used in malting. The latest increase in the demand for malting barley is for use in the manufacture of industrial alcohol. Farmers are naturally attracted by the premium for malting barley. It is a source of cash revenue and a profitable one.

In favorable years barley of good malting quality is produced over wide areas, and the price is accordingly depressed. The gains in balanced husbandry should not be sacrificed in mass attempts to produce malting barley. Only those farmers who have a reasonable chance of harvesting grain of the desired quality are justified in changing from a feed to a cash crop. The farmers most likely to profit from this market are those operating on suitable lands in barley-growing sections. Varieties wanted by the buyers can there be grown with little or no sacrifice of yield. The local market also is built around the malting demand, and the local grain dealer is in touch with the market and is equipped to serve the grower by not allowing the better barley to lose its character through mixture in the elevator or in shipment. Facilities for preventing mixture are not available in localities where little barley is grown.

The war has increased the demand for feed barley for the production of meat and dairy products. In general, feed barleys should be grown by farmers who expect to use the crop primarily as feed; by farmers in sections where little barley is grown; by farmers in sections where the malting varieties yield decidedly less than the feed varieties; and by farmers in any section where farms are of such character that good malting quality is rarely produced. The market preference for varieties is of little importance to the farmer who feeds his crop, and malting premiums are of little interest to the farmer who cannot grow malting barley.

The growing of barley should be continued on a healthy basis, free from the violent shifts of acreage induced by premiums or lack of premiums for malting barley. This can be done only by maintaining

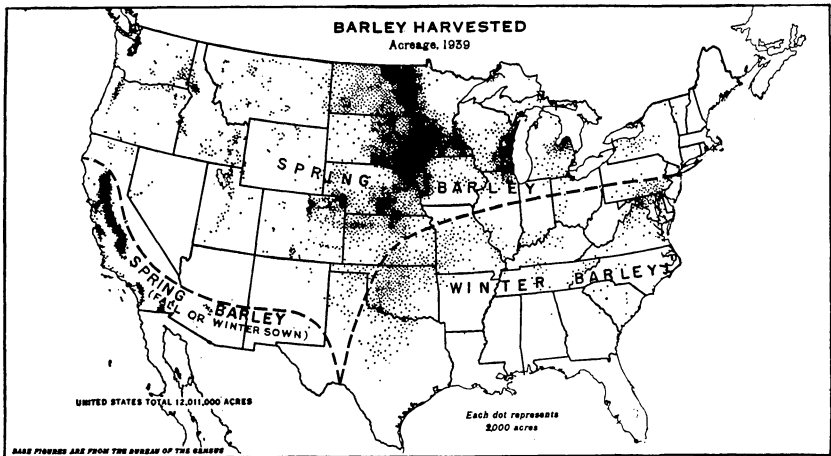


FIGURE 1.—The three general regions of barley production in the United States. The acreage shown is according to the 1939 census. Suitable localities are indicated by the present distribution of the crop.

a large acreage destined for feed. The soundness and permanence of the barley acreage is dependent on the combined judgment of the individual planters.

The farm labor shortage requires that every means at the farmer's disposal be employed for the greatest production. Some crops, as row crops, require more labor than others. It often is possible to save labor by substituting one crop for another when both are intended for the same use and produce about the same yield. For example, in many areas outside the Corn Belt, barley could be grown in place of corn with a saving in labor. Other row crops also could be replaced by barley with a similar saving.

### MALTING BARLEY

Any discussion of malting barley is complicated by the great diversity of soil and climate throughout the United States. The types suited to the several regions are so different and the methods of growing and caring for the crop so varied that the subject cannot be discussed from the standpoint of a single section. The country, how-

ever, can be divided into regions that will be discussed separately. The three most important divisions are shown in figure 1.

#### NORTHERN AND EASTERN STATES

As far as the American market is concerned, the most important barley region consists of the Northern States east of the Missouri River. Although many kinds of barley are grown in this region, the so-called "malting varieties" do well throughout the area, and an acceptable quality results where soil and seasonal conditions are favorable. The malting market, however, is a critical one, and the farmer who wishes to be successful in this field must be familiar with the requirements.

#### What the Maltsters Want

The eastern maltsters and brewers want a plump, mellow, small-kernelled barley with firm hulls not easily damaged. They wish it all to be carefully threshed and to be of the same type, sound, and free from damage by weather or disease. In actual field culture grain is seldom produced that is free from all objectionable features. The farmer growing barley for market should not only make every reasonable effort to enhance the quality as far as it is determined by factors under his control but should also be sufficiently familiar with malting requirements to be able to decide whether his barley meets these standards.

Federal grades for malting barley under the Grain Standards Act have been established for barley grown east of the Rocky Mountains, effective July 1, 1937. The requirements for malting barley include the following specifications:

This subclass shall include six-rowed barley of the class barley (class I) which meets the requirements of grades Nos. 1 to 3, inclusive, which, after the removal of dockage, contains not more than 5 percent of two-rowed and/or other types or varieties of barley of unsuitable malting type, such as Trebi and black; which contains not more than 15 percent of barley and other matter that will pass through a 20-gage metal sieve with slotted perforations 0.076 ( $4\frac{7}{8}/64$ ) of an inch wide and three-fourths of an inch long; which contains not more than 5 percent of skinned and/or broken kernels; which contains not more than 4 percent of damaged barley; and shall not include bleached barley. Barley of this subclass shall contain 75 percent or more of mellow barley kernels, which kernels are not, en masse, semisteely.

Black barleys (as Lion) are objectionable not because they differ much from Oderbrucker or Wisconsin Barbless, but because black kernels are sometimes difficult to distinguish from heat-damaged kernels and because the maltsters do not want them and pay less for barley when they are present.

Broken kernels are objectionable in barley intended for malting, because they will not malt and must be removed and sold as feed barley. Skinned kernels are even more objectionable than broken kernels because they cannot be screened out and do not germinate and convert properly during the malting process. Frayed ends are objectionable. In many cases such kernels are damaged. Even if no real injury exists, malt made from barley containing many frayed ends has a poor appearance and will not sell so well as that made from barley with unbroken hulls. Only 4 percent of damaged barley of all kinds is allowed in the malting grades. Damaged barley includes blighted,

moldy, heat-damaged, sprouted, and badly weather-damaged kernels. Blighted kernels, which include those affected by scab and stripe, may be very objectionable, and the limit of tolerance cannot be much greater than that specified in the grades.

#### Locality and Soil

Most of the barley that is malted is produced in a few States in the upper Mississippi Valley (fig. 2). In these States the best of the crop comes from a few localities, in the most favored of which grain of malting quality is produced almost every year. Other sections produce good grain in 3 years out of 4, in half the years, or only occasionally. Small areas where high-quality barley is produced are well known to local farmers in all States from western New York to South Dakota. Obviously the growers who are favorably situated now pro-



FIGURE 2.—A field of spring barley in the upper Mississippi Valley.

duce and probably always will produce the greater part of the market requirements.

In the barley-growing areas some farms are better suited than others for producing grain of high quality. The best barley soils are well-drained loams. Barley cannot stand "wet feet," and for this reason heavy, poorly drained soils do not produce good barley in regions of frequent rains; not only is the grain likely to be coarse, but the plants also are more likely to be infected with blight and scab. On the other hand, on light sandy soils growth is not maintained at a sufficiently uniform rate, and ripening is often hastened by drought.

#### Varieties

The choice of variety is important. No variety, however, will produce malting barley in a section not suited to barley, nor can it overcome an adverse season. The fact that a variety produces grain of fine quality in western New York should not encourage a farmer in Iowa to plant it in his field. The State agricultural colleges are testing all promising sorts and are the best sources of information for local use. Full information can be had on many varieties, but some of the newer ones must be grown several years before they can be ac-

curately appraised. The type wanted is definite. Maltsters express a decided preference for barleys of the Manchuria-Oderbrucker group and for smooth-awned hybrids from these parents. Large-kerneled six-rowed varieties and two-rowed sorts are apparently not in demand in this section. Oderbrucker, Manchuria, Odessa, and the smooth-awned hybrids, Wisconsin Barbless (Pedigree 38) and Velvet, seem to be acceptable. Manchuria, which is blue or mixed blue and white, and such blue selections of Manchuria as O. A. C. 21, are disliked by some maltsters because of the blue color, which makes the determination of mellowness more difficult. The blue color in itself is entirely harmless, being merely a pigment deposited in the outer layer of the endosperm. It has nothing to do with malting quality. The smooth-awned varieties have a tendency to peel more easily than Manchuria or Oderbrucker. This is an undesirable character. It is worse in poorly grown than in plump, well-matured barley. When carefully threshed, the smooth-awned sorts meet the market requirements.

#### Seed and Seeding

Seed should be sound, clean, and of high germination quality. The use of the fanning mill is important, because it removes weed seeds and many diseased kernels. There is a common impression that seed of high malting quality is desirable for sowing. This is true only so far as malting quality indicates strong germination and freedom from disease. Hard, flinty, steely barley is just as desirable for seeding as is the finest malting barley of the same variety if the germination is equal. There is a decided advantage in early seeding for the locality, for barley does not grow well in hot, humid weather.

#### Rotation

Barley of high quality is seldom produced on land that is too highly fertile. On rich lands manures are best applied to the preceding crop, as the residual effect is sufficient for barley. Coarse grain and lodging are often prevented in this way. In areas where scab is serious, barley should preferably follow some crop other than corn or small grain.

#### Harvesting and Stacking

In the harvesting of malting barley the farmer must meet a number of serious problems. Sound, fully ripened grain is without question of great importance to the maltster. On the other hand, the longer the grain stays in the field, the greater the hazards from storm and moisture damage. Ripened under the best of conditions in a humid climate, the grain assumes a bright straw color.

Quality is often seriously impaired during ripening and harvesting. The crop should stand until fully ripe. Not only is the grain more mellow, but the proteins cause less trouble in brewing. The proteins of growing grain are very different from those in the fully matured kernel. The same is true, in a way, with the starch. If growth is arrested by drought or too early cutting, the kernels are likely to be "steely." Such grain does not malt well and brews worse. Care should be taken not to cut the crop too soon. Probably the thumbnail test to determine maturity is as good as any. Grain is ready to cut



with the binder when the kernel will retain the imprint of the thumb-nail pressed against it.

Color can easily be overemphasized. In dry sections or where the crop ripens without rain or dew, perfectly matured grain may have very little of the yellow color that is characteristic of grain ripened where light rains and dews are common. A deeper color in humid sections is not a cause for lower price, and the farmer should not sacrifice quality to obtain grain that exhibits the same brightness as that found in drier sections.

Frequent rains at harvesttime often injure the quality of the grain. Any considerable number of kernels with blackened ends lowers the market value. Musty odor is a danger signal to the barley buyer, and even a small percentage of decayed kernels may remove a shipment from the malting class. Extra care must be used in shocking and stacking barley intended for the malting market. Minimum exposure to unfavorable weather is desirable.

Stacking improves the quality of barley. Something occurs during the process of going through the sweat in the stack that makes barley more mellow and increases both the vigor and percentage of germination.

#### Threshing

Great care should be exercised in threshing malting barley. Skinned and broken kernels are a hazard to the maltster, and any chance of receiving a premium for the crop can be ruined in threshing. The maltster would rather have a few awn fragments remain on the grain than be confronted with threshing damage. Especial care may need to be taken with the smooth-awned varieties. Any thresher can adjust his machine to decrease threshing damage. Square instead of rounded teeth in the concaves result in fewer broken kernels in the final product. Elimination of end play in the cylinder is of great importance.

#### CENTRAL PLAINS

The area discussed as suitable for the Manchuria-Oderbrucker type of barley has been very crudely bounded. "East of the Missouri," of course, does not mean that the Missouri River marks a definite boundary. Eastern Nebraska, for instance, is as much a part of the region as southern Iowa. As one goes farther west, however, conditions gradually change. The Manchuria-Oderbrucker types do not yield so much as many others do, and they shatter badly in the drier sections.

The western types come into competition with the eastern ones in northwestern Kansas and adjacent areas. The most dependable varieties in this transition area in the past have been related to those long grown on the Pacific coast. Manchuria-Oderbrucker types also can be grown, although at some sacrifice of yield. The maltsters on the eastern markets prefer the Manchuria-Oderbrucker type, but when of good quality the larger kernalled Coast type is also in some demand. Under such conditions the farmer has a difficult decision to make. The correctness of this decision is dependent on many factors beyond his control. Whether he has good barley depends on the season. Whether there will be a profitable premium for it depends on seasonal conditions over a wide area.

## NORTHERN PLAINS

Recommendations for the dry lands of Montana and adjacent areas are equally difficult to make. The Manchuria-Oderbrucker barleys do not yield well here and they shatter badly. Much of the grain that is grown is needed for feed. The areas of production are scattered, and the freight haul to commercial malting plants is a sizable cost factor. Barley is best used as feed in this area. The varieties found suitable so far are all of the large-kerneled type. In areas where malting barley is grown, however, Velvet is the variety to use.

## MOUNTAIN STATES

The agriculture of the western mountain country, like that of all mountain countries, is largely confined to the many irrigated valleys, each one a problem in itself. Regardless of variety, the grain from these valleys will always be plumper, of lower nitrogen content, and more mellow than that produced in the upper Mississippi Valley. Grain of the character obtained in the upper Mississippi Valley could not be produced here even if it were desired. Furthermore, in this area, barleys of the Manchuria-Oderbrucker type shed most of their kernels before harvest. The brewing problem here, then, becomes quite different from that in Milwaukee or Chicago. If the brewer uses local material, he will probably find it good and far more uniform than that of the East, but he will have to develop his own methods of utilization.

Volume, of course, is limited, since under highly specialized irrigation farming, the percentage of land in grain is not large, and much of the barley produced is needed for feed. The scarcity of feed grains in the Mountain States and the high price paid for them often makes the importation of malt economical.

Since the better barley in the Mountain States is produced under irrigation, the judicious use of water is important. Unfortunately, there are no rules by which the most favorable conditions can be obtained or maintained. No two fields or two seasons are alike. The object of irrigation is, of course, to keep the plants growing well, and the timing of watering must depend on the judgment of the farmer. Wherever possible, the land should be so handled that there will be sufficient water in the soil to germinate the grain. Applications of water after seeding to start growth are usually disastrous. Too rank growth at heading time is undesirable. Late irrigations also are a problem. There is danger of lodging the grain. On the other hand, failure of water before full maturity cuts heavily into the yield and lowers the quality. The kernels continue to grow until they dry. Any kernel that will not retain the imprint of the thumbnail is still growing. Thinly seeded nurse crops often produce high yields because irrigations are continued to save the grass. If possible, the last irrigation should be late enough to furnish moisture until the plant has ripened naturally. When malting barley is grown under irrigation, the threshing should be watched carefully. The dry kernels break easily, and special care should be used in adjusting the machines to meet these particular market requirements.

### PACIFIC COAST

The conditions on the Pacific coast are peculiar to that area. Most of the market barley is raised in the interior valleys of California. The small-kerneled Manchuria-Oderbrucker barleys cannot be grown here. After the war England probably will furnish the market again, and her maltsters prefer barleys of the Coast type. Considerable barley is malted locally, and in some years fairly large quantities of California barley are shipped east for malting purposes. Atlas is the dominant variety at present. Purity of type and freedom from threshing damage are important and are under the control of the farmer. Club Mariout is useful in late sowing and, when well grown, is used by some of the English maltsters. The Coast type was formerly produced in some quantity in eastern Oregon and Washington. There are also special sections where barleys of other types and of high quality can be grown, as in the Salinas Valley of California and the section west of the Cascades in Oregon and Washington. Hannchen is the dominant variety in western Oregon and in the Klamath Falls district, which lies on the border between Oregon and California. This variety is used for malting both on the Pacific coast and in the East.

### SOUTHERN STATES

Many of the localities where barley can be grown cannot be separately discussed. In the Southeastern States, hooded and bearded winter varieties are grown. Conditions at harvest are often unfavorable, and over most of the South the growing of malting barley is not recommended.

### FEED BARLEY

Barley used as feed may or may not be of the varieties or have the qualities desired by maltsters. It may be grown solely for feed, or it may be the result of an unsuccessful attempt to grow barley acceptable to the maltsters.

Market terminology has done much to retard the expansion of the barley acreage. Grain rejected by the maltsters is called "feed barley." It usually consists of inferior grain and is only second-rate feeding material. Barley grown for feed need not be inferior grain. Indeed, in the good barley sections it is usually of relatively high quality.

In many ways it is unfortunate that feed barleys are not a crop entirely distinct from malting barleys. The value of barley for feeding must be measured by its usefulness on the farm. The return in terms of pounds of pork or gallons of milk should be the farmer's gage. The appraisal of feed barley would be much less difficult if there were no other barley market.

In the years when brewing was prohibited there was a marked increase in the barley acreage. This increase was, of course, for feed. Much of the recent shifting in barley acreage has been outside the better-known area of malting-barley production. There was a short-lived expansion into the Corn Belt, but a heavy infection of scab discouraged any rapid or careless expansion in this direction. On the Great Plains there is an apparently permanent increase. This has been particularly heavy in northwestern Kansas.

Spring barley is best adapted to the Northern and Western States. Much of this area is outside the Corn Belt. A grain feed that can be substituted for corn is, of course, of great value. Barley is particularly suited to this purpose, both because of its yielding capacity and its feeding value. There has been a marked increase in the winter barley acreage in the Southeastern States. Here it serves a dual feed purpose in that the crop is often pastured in addition to being used as a feed grain.

On favorable soils, barley yields more pounds per acre than any other small grain. It fits in well with the systems of agriculture practiced in most of the areas where the crop is adapted. Almost the equal of corn, as a feed, it can be fed to all classes of livestock and is constantly increasing in popularity with dairy farmers. As in the case of corn, it is especially prized as a feed for hogs, because it produces firm pork. The value of clean and sound barley for feeding hogs depends largely upon its bushel weight. Barley weighing 48 pounds a bushel has almost the same value as corn. If it weighs only 44 pounds, experiments indicate that it is worth about 10 percent less for hog feeding. This is due to its higher fiber content, greater bulkiness, and, therefore, lower nutritive value. For other classes of livestock the higher fiber content is not such an important factor. In fattening cattle, scabby barley, which has a considerably lighter weight than sound barley, has practically the same value, pound for pound, as sound barley. Ordinarily, hogs will not eat scabby barley.

There is little difference in the feeding value of varieties. The farmer growing barley for feed ordinarily should use the highest-yielding variety. Other things being equal, the percentage of hull is higher on small-kerneled than on large-kerneled varieties. Feeding tests, however, have shown little difference in the value of the different kinds if they are plump and well-grown.

The barley kernel is too hard to use satisfactorily as feed without some previous preparation. Grinding is the most common treatment in the Central and Eastern States. The grain should not be ground fine, as fine-ground barley makes a pasty mass when chewed by animals, and feeding it results in reduced consumption. When barley is ground, the machine should be so set as merely to crack the grain rather than pulverize it. In the West much of the barley is rolled. This is an ideal method of preparation. A jet of steam softens and moistens the kernel so that little loose material results. At the same time the entire kernel is flattened to a soft, easily crushed disk.

When barley is to be mixed with chicken feed the hulls are sometimes removed. This separation need not be complete. The removal of most of the hull increases the palatability for chickens and greatly improves the quality of the feed by reducing the quantity of roughage.

### VARIETIES OF BARLEY

More than 5,000 varieties of barley have been tested by the United States Department of Agriculture and the State agricultural experiment stations. Only a few varieties are under cultivation on farms. There is a decided advantage in growing a limited number of varieties. Mixtures are a great disadvantage to the maltster, and the fewer sorts grown, the less the confusion in marketing. Some of the most important varieties are briefly discussed below.

**MANCHURIA, ODERBRUCKER, ODESSA, AND O. A. C. 21**

Manchuria, Oderbrucker, Odessa, and O. A. C. 21 are similar in kernel character and are the type preferred by the maltsters of the Mississippi Valley. Although all four are grown in the Northern States east of the Missouri River, the centers of production are distinct. Odessa is largely confined to South Dakota. Oderbrucker is grown most extensively in Wisconsin. Manchuria is more common in western Minnesota and North Dakota. O. A. C. 21 is extensively grown in Canada. The acreage of all these varieties has been reduced in the United States because of farm preference for the smooth-awned sorts. The grain of Oderbrucker is the whitest of the lot; Manchuria consists of a mixture of blue and white strains; whereas O. A. C. 21 is a blue strain of Manchuria.

**TWO-ROWED**

Two-rowed barleys are not grown extensively. Most maltsters prefer a smaller kernalled barley, which is in greater demand for brewing. Spartan is grown in Nebraska, Iowa, and the Dakotas and on a small acreage in Michigan. Alpha is grown in New York and Pennsylvania. Compans is common in Montana, and occasional fields of Horn, Smyrna, Spartan, and Steigum are found throughout the Plains States. Hannchen is grown in western Oregon and in the Klamath Falls district, on the border between Oregon and California.

**SMOOTH-AWNED**

Farmers naturally prefer smooth-awned barleys. The United States Department of Agriculture and many State stations have tried to breed suitable varieties. The yields of smooth-awned varieties are satisfactory. Among those in common cultivation are Wisconsin Barbless (Pedigree:38), Velvet, and Spartan in the upper Mississippi Valley. Vaughn and Hero have attained a small acreage in California. Velvon and Lico are grown in the Rocky Mountain irrigated valleys. Flynn and Beecher are increasing in acreage in western Kansas and eastern Colorado. Arivat is a new variety in Arizona.

**TREBI**

Twenty-five years ago Trebi was released to farmers of southern Idaho. All that was known then was that it was well adapted to irrigated lands in this section. Since then it has spread over much of the northern part of the United States and up into Canada. Although its actual field cultivation has not extended east of the Mississippi River, it has produced high yields on experiment station plots as far east as the eastern part of Canada. The variety is unquestionably one of the most vigorous that has been tested. Despite its low resistance to most diseases, it has outyielded other varieties in sections to which by any other measure it seems not to be suited. The grain as produced in eastern North Dakota is very different from that of Idaho, but from the standpoint of feed, it deserves consideration. Maltsters of the Mississippi Valley do not like Trebi. Their acquaintance with the variety is limited to that grown in the northern plains and in the western half of the upper Mississippi Valley. Brewers of the Rocky Mountain area may find the Trebi grown in this

area satisfactory. This is especially true of that produced under irrigation.

#### ATLAS, COAST, AND CLUB MARIOUT

Coast was the common barley of the Western States for many years. The original Coast and Atlas, the latter a selection of Coast, are still grown on most of the acreage in California. Coast is common throughout the Western States. Club Mariout is limited mostly to California, where it is popular for late seeding.

#### WINTER BARLEY

The acreage of winter barley is increasing in the area to which it is adapted. While it is grown on isolated farms in nearly every State, the main areas lie south and east of a curved line running from New York City through Kansas City and western Texas (fig. 1). Winter barley is grown for grain, as a cover crop, and for fall and spring pasture. Seeded early, it produces abundant pasture, particularly in the southern latitude, where growth is not stopped by cold weather. In many cases it also is pastured in spring, but prolonged grazing reduces the grain yield. Seeded in fall, it serves as a cover crop, and on hilly land it does much to control soil erosion. Since barley is one of the earliest crops harvested in the South, it often serves as a "filler feed crop" when the supply of corn runs out.

Barley is well suited as a companion (nurse) crop for the small-seeded legumes and grasses (fig. 3). It usually ripens earlier than



FIGURE 3.—A field showing winter barley as a companion (nurse) crop for red clover.

wheat or oats, has shorter straw, and is less leafy. For these reasons it robs the legume or grass to a lesser extent of moisture, plant nutrients, and sunlight. Barley fits well into a 1-year rotation with lespe-deza or soybeans in areas where these legumes are adapted.

Along the colder limit of the winter barley area, it is important that winter-hardy varieties be grown. Here, it is best to plant varieties locally used or those known to be hardy. In many sections, barley is cut somewhat green and fed as hay. Many farmers use hooded varieties for this purpose, but smooth-awned varieties are equally well suited for this use.

Tennessee Winter (fig. 4), Reno, Ward, Kentucky 1, Purdue 21, Wisconsin Winter, and selections of Tennessee Winter are among the hardiest of the bearded winter varieties. In many Southeastern States the hooded are more popular than the bearded varieties. The first distribution of hooded varieties came from the Tennessee Agricultural Experiment Station, and these have been added to by other southern stations and by natural hybridization on farms. The hooded varieties yield less than the bearded in most instances. The most commonly grown are Tennessee Hooded 5, Tennessee Hooded 6, and Missouri Early Beardless. Smooth-awned varieties are making their appearance in the winter barley area, the more commonly grown being Marnobarb, Texan, and Jackson. In areas where there is little danger from winter-killing, semiwinter-type varieties are often preferred, though usually they are not so hardy. Wintex, Texan, Randolph, and Tenkow are of this type. Many States have released new varieties. These are not discussed here but are mentioned in the last section, on What, When, and How Much to Seed.



FIGURE 4.—A field of Tennessee Winter barley.

### WHERE TO PROCURE SEED

Most of the varieties recommended are already in wide cultivation, and seed may be obtained from nearby farmers. In most States certified seed can be obtained from seed growers' associations. The State agricultural college can usually furnish information as to sources. Many local seedsmen carry the more important varieties.

### DISEASES

Four of the most important diseases of barley for which chemical or cultural treatments are known are scab, stripe, covered smut, and one kind of loose smut.

Scab, largely confined to the Corn Belt, affects the quality of the grain and reduces the yield. Barley with more than a small percentage of scab cannot be used for malting. It is also unsuitable for feeding pigs, as it causes vomiting in extreme cases, and on grain less heavily infected the pigs fail to make normal gains. Scabby barley can be fed to all classes of cattle and sheep.

Treatments for scab are largely preventive. Since the disease is carried over on cornstalks and grain stubble, such material should be carefully plowed under before seeding. The disk obviously is no substitute for the plow on stubble land. Fields that were not planted either to corn or to small grain the previous year are likely to have less scab. In scab areas the seed should be run through the fanning mill before being sown, to remove as many infected kernels as possible. Also the grain should be treated with a mercury-dust compound (New Improved Ceresan) for control of the seedling blight due to scab-infected seed. Follow carefully the directions for treatment given on the label of the can. *Mercury-dust compounds are poisonous. Treat seed outdoors or in a well-ventilated building. Avoid inhaling large quantities of the dust. Wear a dry cloth or dust mask over the nose and mouth. Do not feed treated seed to farm animals.*

Blighted barley is a market problem. Darkened, underdeveloped kernels are caused by a wide variety of organisms in addition to that of scab. The effect of many of these is less objectionable than scab, especially for hog feeding. The buyers are often unable to determine the cause of the damage or to distinguish scabby kernels from kernels affected by other organisms. Seed treatments and clean culture reduce the degree of infection by some of these organisms.

Covered smut is the most widely distributed of the important diseases of barley. The total loss due to it is considerable. The percentage of infection varies enormously with season and region. Where covered smut is common, clean seed should be used if possible. When clean seed is not at hand, farmers should resort to dust treatment.

Mercury dust (New Improved Ceresan) is a logical choice, not only because of its usefulness in controlling covered smut but also because it controls leaf stripe, seedling blight due to scab, and one kind of loose smut where these are present. The other kind of loose smut can be controlled by the hot-water treatment. Because, however, of the serious seed injury that may result, the hot-water treatment is not recommended for use by farmers. County agricultural agents can give suggestions as to sources of chemicals and methods of treatment.



## CROP ROTATION AND COMMERCIAL FERTILIZERS

In many sections, local practices connected with the growing of barley have distinct advantages. These practices should be sought and followed insofar as they are well founded. Crop rotation and cultural practices are usually local problems, particularly with respect to the use of commercial fertilizers or barnyard manure. Commercial fertilizers are of special importance in the Southeastern States. In all these matters it is profitable to seek the advice of the county agricultural agent or the State agricultural college.

### WHAT, WHEN, AND HOW MUCH TO SEED

The following recommendations, obtained from the State agricultural experiment stations, are based on the latest available information on what variety to seed, the best time to seed, and how much to seed to the acre.

**Alabama.**—Marnobarb, a smooth-awned barley, and Tennessee Winter, a rough-awned sort, are the recommended varieties. Seedings should be made in October at the rate of 6 to 8 pecks an acre.

**Arizona.**—Arivat, Vaughn, and California Mariout are recommended for the irrigated valleys of southern Arizona, seedings to be made in fall and early in winter. After February 1, only California Mariout should be used, as this variety is better adapted to late seeding. For pasture, Vaughn should be used, and seeded as soon as the danger from hot weather is past, usually about the last of September. Velvon is recommended for all elevations of more than 3,500 feet, and seedings should be made as soon as the land can be prepared in spring. The recommended rates are 90 pounds an acre for grain and 110 pounds for pasture.

**Arkansas.**—Tennessee Winter Selections 52, 56, 57, and 66 are recommended. They are bearded varieties and yield more grain than the more widely grown hooded sorts, as Tennessee Beardless 5, Tennessee Beardless 6, and Missouri Early Beardless. Seedings should be made the first week in October at the rate of 7 pecks an acre.

**California.**—Vaughn is the highest yielding and most generally adapted variety to grow as feed barley. Atlas is recommended where malting barley is to be produced. Club Mariout and Tennessee Winter meet specialized market demands and are less generally adapted than Vaughn or Atlas. The new variety Rojo, which is similar but superior to Hero, is recommended where barley is needed for either hay or grain. Where early maturity, extreme drought, or late seeding are involved, California Mariout should be used. The best time to seed is from late in October until mid-January. March seedings are seldom satisfactory with varieties other than California Mariout. Seeding rates vary from 40 to 100 pounds an acre, depending on moisture supply, weediness of the land, and manner of seeding. When broadcast, 25 percent more seed should be sown.

**Colorado.**—For irrigated lands similar to those at Fort Collins, the recommended varieties are Lico, Trebi, Colsess, and Hannchen. For malting, Wisconsin Barbless (Pedigree 38) and Velvet are recommended. At high altitudes similar to that at Fort Lewis, Trebi and Colsess should be used. Colsess is particularly well suited as a companion (nurse) crop for alfalfa and red clover and for hay. Under dry-land conditions similar to those at Akron, Beecher, Club Mariout, Flynn, and Vance Smyrna are recommended. In areas under irrigation, seedings should be made from April 1 to 20, and progressively later at higher elevations. A good seeding rate is 2 bushels an acre. Under dry-land conditions, seedings should be made late in March or early in April at the rate of 4 pecks an acre.

**Delaware.**—Winter barley predominates in Delaware. Tennessee Winter and Kentucky 1 are recommended, as is also Marnobarb, a smooth-awned variety,

but it usually does not yield so much as Tennessee Winter or Kentucky 1. Seedings should be made before the last of September, at the rate of 2 bushels an acre.

**Georgia.**—The recommended varieties are Tennessee Winter Hooded and Greece, the latter a bearded type. Newer varieties showing promise are Clemson Hooded, Randolph, and Davidson; the last two are bearded types. Barley is best adapted to the extreme northern part of the State and gradually less so toward the southern part, where it is unadapted. On good land fair yields can be obtained in the Piedmont and upper Coastal Plains. Seedings should be made late in September or early in October in the northwestern part of the State and in October elsewhere, at the rate of 6 to 8 pecks an acre.

**Idaho.**—Trebis and Velvon are recommended for the irrigated lands of southern Idaho. Trebi also should be used in the Palouse section of the State, and Hannchen and Union Beardless on cut-over lands in the northern part. Flynn and Vaughn are suggested for the drier sections in the southeastern part. Winter Club is recommended for fall seeding in the Palouse and other areas where winter conditions are not too severe. Where a more hardy fall-sown variety is needed, Ward is suggested. Seedings on irrigated lands should be made as early in spring as possible at the rate of 100 pounds an acre. Where barley is used as a companion (nurse) crop for legumes or grasses, the rate should be reduced to 80 pounds an acre. Seedings on nonirrigated lands also should be made early in the spring. The seeding rate will vary from 4 pecks an acre in the drier sections to 6 or 7 pecks where the rainfall is more abundant.

**Illinois.**—Wisconsin Barbless (Pedigree 38) is recommended for general production in the central and northern parts of the State for both market and feed grain. Where Trebi is grown, it should be considered only as a feed grain. Spartan is useful where a stiff-strawed variety is needed, and because of its early maturity it is recommended for southern Illinois when a spring barley is desired. Early seeding is extremely important on the southern edge of the barley area. Around Urbana, seedings should be made early in March; in the northern part of the State, somewhat later. The recommended rate is 8 pecks an acre. Considerable winter barley is grown in southern Illinois. Purdue 21, Kentucky 1, and Missouri Early Beardless are best adapted. Winter barley is attacked by hessian fly and hence should not be seeded earlier than the recommended fly-free date in years when this insect is a factor. In fly-free years, and especially when the crop is intended for pasture, winter barley should be seeded in September. The recommended rate is 6 to 8 pecks an acre.

**Indiana.**—Winter barley is increasing in popularity in the southern third of Indiana, except on poorly drained and strongly acid soils. Kentucky 1 is the recommended variety. Seedings should be made from September 15 to October 1, or about 10 to 14 days earlier than winter wheat, at the rate of 6 to 8 pecks an acre. Spring barley should be grown only in the northern two tiers of counties in the northwestern part of the State, and only on fertile loam and silt loam soils. Spartan and Alpha are the varieties recommended for feed. Spring barley should be seeded early, preferably during March, on land that needs little seedbed preparation, as corn stubble, soybean stubble, or fall-plowed land. The seeding rate should be 8 to 10 pecks an acre.

**Iowa.**—Wisconsin Barbless (Pedigree 38) and Velvet are recommended for malting and feed. For the war emergency, Spartan is recommended as a feed barley for the southern third of the State. Barley responds favorably to early sowing, and it should be sown by April 15. The yields are much less when sown after this date. The rate should be 2 bushels an acre, except in the case of the large-seeded variety Spartan, which should be at 2½ bushels.

**Kansas.**—For spring seeding, Flynn and Beecher are recommended. Seedings should be made March 10 to April 10 at the rate of 5 to 7 pecks an acre, depending on the locality. The winter variety Reno is recommended for fall seeding, from September 15 to October 10, at the rate of 2 bushels an acre.

**Kentucky.**—Winter barley is a fairly dependable crop on the better soils. Local strains that are apparently identical with Tennessee Winter and Kentucky 1 are most widely grown. Kentucky 1 has a stiffer straw than most other winter varieties and seems to be somewhat superior in yield. It is moderately winter hardy and equal in this respect to most other local strains. Tests have shown that it is well adapted to Kentucky conditions. Seedings should be made

in the latter part of September in the northern half of the State and early in October in the southern half. Earlier seeding is desirable for fall pasture. Very late seeding subjects the crop to more winter-killing. The rate of seeding varies from  $1\frac{1}{2}$  to 2 bushels an acre, depending on soil productivity and time of seeding.

**Maine.**—Byng, six-rowed and smooth-awned, and Alpha, two-rowed and rough-awned, are the recommended varieties. Seedings should be made as early as possible in May, at the rate of 100 pounds an acre.

**Maryland.**—Winter barley predominates in Maryland. Marnobarb, a smooth-awned variety, and Tennessee Winter are recommended for general use. Marnobarb is preferable except at the higher altitudes. Seedings should be made by the last of September at the rate of 2 bushels an acre.

**Michigan.**—Wisconsin Barbless (Pedigree 38), the variety most commonly grown, yields satisfactorily in all the barley-producing areas and is suitable for either feed or malting. Spartan barley, however, is superior for use as a companion (nurse) crop with seedings of alfalfa, clover, or other forage crops, because of the stiff straw and sparse foliage. Spartan is very acceptable as a feed barley, but the grain generally cannot be sold for malting purposes. Seedings should be made as early as possible in spring, at the rate of  $1\frac{1}{2}$  to 2 bushels an acre.

**Minnesota.**—The recommended varieties are Wisconsin Barbless (Pedigree 38), Velvet, and Peatland. Peatland is recommended particularly for peat lands or in areas where scab is a serious problem. Seedings should be made as early as the ground can be prepared, usually by April 10 in some parts of the State, but in others not before April 25. The recommended rate is 2 bushels an acre.

**Mississippi.**—The barley acreage in Mississippi has increased in recent years. Wintex, Texan, and Texas Winter are satisfactory and should be sown during October on a well-prepared seedbed. Spring seedings are usually not satisfactory, on account of diseases. For a good yield, most soils need a nitrogenous fertilizer and local recommendations on rates and time of application should be followed. The recommended seeding rate is 5 to 7 pecks an acre.

**Missouri.**—Winter barley is used extensively for fall and spring pasture and as a grain crop. It is an excellent companion (nurse) crop for grasses and legumes and on hilly land is effective in the control of erosion when grown in a 1-year rotation with lespedeza or soybeans. It is also used as a substitute for corn on upland soils of medium fertility. Where barley is grown primarily for pasture, the hooded variety Missouri Early Beardless should be used. Where grain is the primary objective, Reno and Michigan Winter are recommended, especially in the northern part, because of the greater danger from winter-killing. Reno and Michigan Winter are awned varieties and are superior to Missouri Early Beardless in winter hardiness and in grain yield. For pasture, barley should be sown late in August or early in September at the rate of 8 pecks an acre. For grain, the best seeding time is late in September, at the rate of 6 to 8 pecks.

**Montana.**—Trebi, Compana, and the new variety Glacier are recommended for feed. Trebi and Glacier are best suited to irrigated land. Glacier can be grown on dry land also, but Compana is the best variety for this purpose. For malting, Velvet is recommended. Seedings on irrigated land should be made from late in April to May 15, at the rate of 96 pounds an acre; and on dry land, as early as the season will permit, preferably on clean summer-fallow land, at the rate of 60 to 72 pounds an acre.

**Nebraska.**—Spartan, Ezond, Trebi, and Club Mariout are the recommended varieties, Trebi especially for irrigated lands in the North Platte Valley. Seeding is usually at the rate of 2 to  $2\frac{1}{2}$  bushels an acre in eastern Nebraska, the rate diminishing materially toward the west under nonirrigated conditions. Seedings should be made late in March or early in April in the eastern part of the State, and progressively somewhat later toward the west.

**Nevada.**—Trebi is recommended for most of the State, except on lighter soils, where Coast should be used. April is the most favorable time to seed in the northern and central part. In the southern part seeding should be done somewhat earlier. Barley is usually sown 2 to 4 weeks after spring wheat. The recommended rate is 80 to 90 pounds an acre.

**New Jersey.**—Velvet and Comfort are recommended for spring seeding and Maryland Smooth Awn (Marnobarb) where a fall-sown variety is desired. Spring sowing should be in mid-April at the rate of 8 to 10 pecks an acre. Fall seedings should be made between September 20 and October 1 at the rate of 6 to 8 pecks an acre.

**New Mexico.**—New Mexico Winter 1 is recommended for fall seeding. Winter barley is especially well suited for pasture and grain production on the irrigated lands in the southern part of the State. Seedings should be made from September 15 to October 15, at the rate of 80 to 100 pounds an acre. Spring barley should be grown in the higher irrigated valleys. The recommended varieties are Trebi, Conway, and Velvon, seeded from February 15 to March 15 at the rate of 80 to 100 pounds an acre. On the dry lands in northwestern New Mexico, the varieties White Smyrna and Stavropol should be seeded from March 15 to June 1 at the rate of 40 to 50 pounds an acre.

**New York.**—Alpha and Wisconsin Barbless (Pedigree 38) are the recommended spring varieties. Seedings should be made late in April or early in May—Alpha at the rate of 2 bushels an acre and the smallerkerneled Wisconsin Barbless at the rate of 7 pecks. Wong is the recommended winter variety. It is resistant to mildew and smut and has a stiff straw. The seeding time will vary from September 10 to 25, depending on location, and the rate should be 6 to 8 pecks an acre.

**North Carolina.**—The acreage in winter barley has increased rapidly in recent years, and in some areas the crop replaces corn on lands subject to serious erosion. Its use as a fall grazing crop is on the increase. Sunrise, Iredell, Davidson, and Randolph are recommended for grain production and Sunrise and Iredell for grazing or forage. Seedings should be at the rate of 2 bushels an acre for grain and 2½ bushels an acre for grazing. October 1 is the recommended date for seeding in the Piedmont area. In the mountainous area, the time should be advanced 10 to 14 days, while in the Coastal Plains it should be delayed until October 15 to November 1.

**North Dakota.**—Trebi is recommended as a feed barley for most of the State, and Spartan, Steigum, and Horn are good varieties to use in the drier sections in the western part. Spartan is a two-rowed variety with smooth awn and stiff straw, and it matures early. It has done well in dry years and is less injured by grasshoppers. Where barley is grown for market, Wisconsin Barbless (Pedigree 38), Manchuria, and Odessa should be grown. Of these varieties, Wisconsin Barbless is best adapted to the eastern part of the State, while Manchuria and Odessa can be grown farther west. Seedings should be made late in April or early in May, at the rate of 6 pecks an acre in the eastern part and 5 pecks farther west. These rates should be increased by 1 peck when Trebi or other large-seeded varieties are used.

**Ohio.**—Spring barley is grown only in the northwestern part of the State and is a relatively poorly adapted crop even in this area. Velvet is the recommended variety and should be sown as early as possible. Winter barley is grown in the central and southern parts, and especially in the western sections. Ohio 1 and Kentucky 1 are the recommended varieties, and seedings should be made from the middle to the last of September. Two bushels an acre should be used for both spring and fall seeding.

**Oklahoma.**—Winter barley yields more grain than spring barley in Oklahoma. When fall-sown, the winter-hardy varieties Ward and Reno are recommended for the Panhandle and the northwestern section. In other parts of the State, where the winters are less severe, Tenkow, Wintex, Manchuria, Wisconsin Winter, Michigan Winter, Tennessee Winter, and other local bearded strains should be used. Missouri Early Beardless also is suggested for the northeastern section when an early maturing variety is needed. Seedings should be made by October 1 in the Panhandle and by October 15 in the remainder of northwestern Oklahoma and during October or early in November in the rest of the State, depending on location. Relatively early seeding dates should be used where pasture production or the prevention of soil blowing is the prime objective. The seeding rates increase progressively from 3 or 4 pecks an acre in the Panhandle to 8 pecks for the eastern two-thirds of the State. Atlas, Vaughn, Beecher, and White Smyrna are the spring varieties recommended for the Panhandle and northwestern Oklahoma; Tenkow, Wintex, and Manchuria for the eastern two-thirds of the State. Seedings in the eastern two-thirds of the State should be made by Febru-

ary 15, and by March 1 in the western part or the Panhandle. The seeding rate varies from 5 pecks in the western section up to 7 or 8 pecks for the eastern section, where the rainfall is heavier.

**Oregon.**—For western Oregon, Hannchen and Union Beardless are recommended for spring seeding. The latter variety is especially suited to fertile soil because of its stiff straw. Where winter barley is grown, Santiam is recommended. In this section, fall sowings should be made from October 10 to 30; spring sowings from March 15 to April 15. The seeding rate varies from  $1\frac{1}{2}$  to  $2\frac{1}{4}$  bushels an acre.

Under conditions similar to those around Pendleton, Trebi is recommended for spring seeding, except in areas of lower rainfall, where Club Mariout should be used. The hooded variety Meloy should be used where barley is intended for hay. Winter barley is increasing in acreage in this area, and where this type is preferred, Winter Club is a good variety to grow. Spring barley should be seeded from March 1 to 15 at the rate of 2 bushels an acre.

With the limited rainfall in the Moro section, Flynn 37 and Meloy are recommended. Flynn 37, a smooth-awned type, should be used for grain, and Meloy, a hooded type, when hay is a prime objective. In this section, barley should be seeded as early in the spring as the ground can be prepared, normally between March 10 and 20, at the rate of  $1\frac{1}{4}$  to  $1\frac{3}{4}$  bushels an acre.

For conditions similar to those at Union, Trebi is recommended for grain production and Union Beardless, a hooded type, for hay, either seeded alone or in combination with spring peas. Where barley is fall-sown, Olympia is recommended. Seedings should be made early for best results, usually from the last week in March and up to the middle of April, for the average farm, at a rate of 1 bushel an acre—slightly less under dry conditions and slightly more where the crop is irrigated.

In the Burns section, Trebi and Union Beardless are the best varieties to grow. Seedings should be made about the first of May at the rate of 2 to  $2\frac{1}{4}$  bushels an acre.

**Pennsylvania.**—Wisconsin Barbless (Pedigree 38) and Alpha are recommended for spring sowing. Seedings should be made from April 5 in the southeastern part to April 20 at State College in the central part and to April 30 at the higher elevations in the northern part. Kentucky 1, Poland, and Tennessee Winter are recommended for fall seeding. Wong, a promising variety not yet tried extensively, is probably less winter hardy than the others. Winter barley is an uncertain crop in the northern half of the State. Fall seedings should be made in the first week of September in the central part and 2 to 3 weeks later in the southeastern part, at the rate of 2 bushels an acre, except when used as a companion (nurse) crop, and in this case the rate should be  $1\frac{1}{2}$  bushels an acre.

**South Carolina.**—The recommended varieties are Clemson Awnless, Maretts Awnless, Sunrise, Maretts Beardless, Clemson Hooded, and Woods Beardless. The first three are awnless types and the last three are hooded. Seedings should be made from September 15 to October 15 when grain production is the primary objective, and about September 1 for grazing. The recommended rate is  $1\frac{1}{2}$  to 2 bushels an acre.

**South Dakota.**—Where barley is intended for malting, Odessa, Wisconsin Barbless (Pedigree 38), and Velvet are recommended. These varieties are best suited to the eastern part of the State and should not be grown in the central or western dry-land areas. Where the grain is intended for feed, the recommended varieties are Spartan and Trebi. Spartan, Trebi, and White Smyrna should be grown in the drier sections. In the irrigated areas in the western part of the State, Trebi and White Smyrna are the varieties to use. Barley should be seeded early in the spring, as seedings made later than April 15 are likely to give reduced yields. It is recommended that 6 pecks an acre be sown in the eastern part of the State, 5 pecks in the central and western part, and 10 pecks on irrigated land.

**Tennessee.**—The recommended varieties are the rough-bearded Tennessee Winter 52, the hooded Tennessee Beardless 5 and Tennessee Beardless 6, and the new smooth-bearded Jackson. Barley is used extensively for pasture, and for this purpose it is often seeded as early as August 15. Crimson clover is frequently seeded with the barley for increased grazing. Seedings should be made from mid-September to early October, at the rate of 2 bushels an acre for the hooded varieties and at a somewhat lower rate for the bearded sorts.

**Texas.**—The intermediate winter varieties Wintex, Texan, Finley, and Texas Winter are recommended for fall seeding in central Texas (October 1 to 20); they are also suited for very early spring sowing (January 1 to 20) there. The spring varieties Flynn, Vaughn, Stavropol, and Beecher should be grown in the north-central part and in the Panhandle, and they should be sown in the north-central part not later than February 15 and in the Panhandle not later than March 15. These spring varieties may also be fall-sown in extreme south-central Texas. Where true winter types are fall-sown in the Panhandle, the winter-hardy varieties Reno, Ward, and Michigan Winter are recommended. A seeding rate of 6 to 8 pecks an acre is recommended for central Texas and 4 to 6 pecks for the western part of the State.

Under irrigation in the south Plains area, the recommended varieties are Atlas, Odessa, and Manchuria for spring seeding and Wintex, Bailey, and Wisconsin Winter for fall seeding. The fall-sown varieties generally yield more grain than the spring-sown. The recommended seeding rate is 6 to 8 pecks an acre.

**Utah.**—Velvon is recommended for spring seeding on irrigated lands. Seeding should be relatively early (March 15 to April 30), at the rate of 2 to 2½ bushels an acre, depending on the condition of the soil. Winter Club is the most promising winter barley for fall sowing on both irrigated and dry-farmed areas, but it may winter-kill in years when conditions are unfavorable. The rate of seeding, which should be governed by soil fertility and moisture supply, varies from 1½ to 2 bushels an acre. For malting purposes the Atlas variety is occasionally sown in fall, but it is more successful when spring-sown.

**Virginia.**—The varieties generally recommended are Wisconsin Winter, Tennessee Winter, Virginia Hooded, and Marnobarb. Marnobarb is less winter hardy and should not be grown where barley is apt to winter-kill. Seedings should be made from September 15 to 30 at the rate of 2 bushels an acre.

**Washington.**—For conditions similar to those at Pullman, Beldi Giant, Rufflyn, and Blue are the six-rowed varieties recommended; Hannchen the two-rowed variety; and Belford and Horsford where hooded strains are desired. The winter varieties Winter Club and Olympia should be used for fall seeding. Under conditions of limited rainfall similar to those at Lind, Meloy, Hannchen, and Flynn 37 are the recommended spring varieties, and Winter Club for fall sowing. Spring seedings should be made as early as conditions permit—in the drier areas, about March 1 to 25; and in the more humid sections of the Palouse, about April 1. Winter barley should be seeded early in September. Seeding rates vary from 5 pecks an acre in the drier areas to 8 pecks in the more humid Palouse.

**West Virginia.**—Nearly all barley in West Virginia is fall-sown. The recommended bearded varieties are Scottish Pearl, Kentucky 1, and Tennessee Winter 52. The last named is especially well adapted to the eastern part of the State. The hooded varieties tested have yielded less than the bearded sorts and are of inferior quality, but where hooded types are preferred Missouri Early Beardless or Tennessee Beardless 6 should be grown. Seedings should be made not later than September 15 at the lower altitude of the northern third of the State and September 20 to 25 for the southern parts, depending on altitude. Winter-killing makes fall-sown barley an unreliable crop at the higher altitudes in the northern third of the State. Alpha, the most promising variety for spring sowing, should be sown as early in spring as a good seedbed can be prepared. Both fall and spring seedings should be made at the rate of 8 pecks an acre.

**Wisconsin.**—Wisconsin Barbless (Pedigree 38), Oderbrucker, and Velvet are the recommended varieties. Seedings should be made as early as possible in the spring, at the rate of 1½ bushels an acre, except that for Oderbrucker 2 bushels should be used.

**Wyoming.**—The recommended varieties for irrigated lands are Lico, Odessa, and Trebi; and for the dry lands, Velvon, Horn, and Trebi. Barley should be seeded as early in spring as possible; this is usually about April 1 to 15 at the lower elevations and progressively later at higher elevations. The recommended seeding rates are 5 pecks an acre for dry land and 8 pecks for irrigated land.